



HOLLYFRONTIER

C-10961

May 13, 2013

Ms. Rasha Allen  
Air Permitting Section  
Bureau of Air  
Kansas Department of Health and Environment  
1000 SW Jackson, Suite 310  
Topeka, KS 66612-1366

RECEIVED

MAY 15 2013

BUREAU OF AIR

Re: Updates to Construction Permit Application  
Naphtha Fractionation Project  
Source ID No. 0150004 - Frontier El Dorado Refining LLC  
El Dorado, Kansas

Dear Ms. Allen:

Frontier El Dorado Refining LLC (FEDR) is submitting this letter to provide you with updates to the Construction Permit Application for the Naphtha Fractionation Project (NFP), and responses to your requests related to the project. The proposed updates are presented in Items I, II, III.A and III.B. Items III and IV are in response to your requests for clarification to previously submitted information for the project. The proposed markups of Approval dated 4/13/2012 for the CokerHGU3 Project are included in Item V.

I. Proposed Control of NO<sub>x</sub> Emission from HGU3 Furnace with SCR:

FEDR proposes to control the nitrogen oxides (NO<sub>x</sub>) emissions from the proposed HGU-3 Reformer Furnace using Selective Catalytic Reduction (SCR) technology. Additional equipment to be installed will include the SCR system, the aqueous ammonia storage tank and piping fugitive components. Ammonia emissions are not expected from the ammonia tank since the tank will operate at a pressure level such that there will be no breathing losses from the tank. During tank filling, the tank will be vented back into the tank truck that refills the ammonia tank; therefore, no loading losses are expected from the tank.

The following are provided in Attachment 1 to this letter for your review:

- Updated Table B-1 for potential NO<sub>x</sub> emissions from the Reformer Furnace;
- Updated Table B-3 to include potential H<sub>2</sub>S emissions from the Reformer Furnace;
- New Table B-15 for potential ammonia emissions from the Reformer Furnace's exhaust stack;
- New Table B-16 for potential ammonia fugitive emissions from the SCR system piping components; and
- Updated Form 6-1.0 for Indirect Heating Unit (Boiler) for HGU-3 Reformer Furnace to change NO<sub>x</sub> Control to SCR.

**Frontier El Dorado Refining LLC**

1401 Douglas Road • El Dorado, KS 67042

(316) 321-2200 • Fax (316) 321-8584

<http://www.hollyfrontier.com>

II. Update to HGU3 Furnace's GHG emissions:

The potential GHG emissions have been updated using more conservative values for carbon content and molecular weight of the fuel to the HGU3 furnace. The updated Table B-6 is also included in Attachment 2 to this letter.

Also, Table 1-1, Project Emissions Increases Compared to PSD Significance Levels, has also been updated and include in Attachment 2.

III. Responses to your questions/comments related to the Naphtha Fractionation Project:

A. Annualized Cost on Table 5-3 (Estimated Cost for CCS of Stack CO<sub>2</sub> Emissions):

*The Annualized Cost in Table 5-3 has been corrected to remove the hidden contingency factor of 1.03. This table 5-3 has also been revised to base the cost estimate only on the CO<sub>2</sub> emissions from the Reformer Furnace, not the total project CO<sub>2</sub>e emissions that include piping fugitives. The revised Table 5-3 is included in Attachment 3 to this letter.*

B. Revised the HGU-3 Average VOC Content Calculations:

*The HGU-3 Average VOC Content used in the HGU-3 Fugitive Emission Calculations has been revised to coincide with the component counts for the HGU3 in Table B-8 (including sampling connections and excluding relief valves). The updated average VOC content is 7.1%. However, this does not change the potential hourly and annual VOC fugitive emissions from the HGU-3. The updated HGU-3 Average VOC Content Calculations and updated Table B-8 are also included in Attachment 3 to this letter.*

C. Please verify that TK-017, TK-020, and TK-447 are Group 1 storage vessels under MACT CC. These tanks are also subject to NSPS K (TK-017 and TK-020) and Ka (TK-447). Therefore, both regulations should be included for applicability purposes. In accordance with 40 CFR 63.640(n)(5) [overlap provisions], Group 1 vessels also subject to NSPS K or Ka are required to only comply with MACT CC. Attachment E (part of TV Permit) includes additional requirements under NSPS for these tanks. Is Frontier complying with both regulations? If so, why?

*Title V lists NSPS K & Ka along with MACT CC to cover the periods in which the tanks store materials that would classify the tanks as MACT Group 2 instead of MACT CC Group 1 [see 40 CFR §63.640(n)(6)].*

D. Please determine if TK-227 and TK-253 (isomerate storage) will be affected by the OLD MACT (a.k.a. MACT EEEE).

*Isomerate is a gasoline blending component and Tanks 227 & 253 storing isomerate meet all criteria for MACT CC Group 1; therefore, these tanks are excluded from the affected source of the OLD MACT per 40 CFR §63.2338(c) which is shown below:*

*§ 63.2338 What parts of my plant does this subpart cover?*

*(c) The equipment listed in paragraphs (c)(1) through (4) of this section and used in the identified operations is excluded from the affected source.*

*(1) Storage tanks, transfer racks, transport vehicles, containers, and equipment leak components that are part of an affected source under another 40 CFR part 63 national emission standards for hazardous air pollutants (NESHAP).*

IV. Proposed permit limit, monitoring, recordkeeping and reporting for GHG emissions:

The proposed emission limit, monitoring, recordkeeping and reporting for GHG emissions are included in Attachment 4 to this letter.

V. Markups of the 4/13/2012 Approval for the CokerHGU3 project to remove HGU3:

The HGU-3 Unit authorized in the Coker Heater and HGU3 Project was not constructed. A new HGU-3 is proposed in the Naphtha Fractionation Project. Therefore, the Coker Heater and HGU3 Permit will be updated to remove equipment and emissions associated with the previously authorized HGU-3 Unit. The proposed marked-up Coker Heater Permit is included in Attachment 5 to this letter. An electronic version of the proposed markup permit is also submitted concurrently.

If you have any questions or comments regarding this submittal, please contact Andrew Beard at (316) 321-8478.

Sincerely,



Andrew Beard  
Environmental Specialist

cc: Mr. Ward Burns, EPA region 7

Attachments

**ATTACHMENT 1**  
**Updated Emissions for HGU3 Furnace**

**Table B-1**  
**Potential NO<sub>x</sub> Emission Calculations for Combustion Units**  
**Frontier El Dorado Refinery**

Unit	Equipment No.	NO <sub>x</sub> Hourly Emission Factor	NO <sub>x</sub> Annual Emission Factor	Potential Hourly Operation	Potential Annual Operation	Potential Hourly Emission (lb/hr)	Potential Annual Emission (TPY)	Baseline Emissions (TPY)	Project Emissions Increase (TPY)				
Modified/New Units													
HGU3 (New)	HGU3 Reformer Furnace (new)	0.015	lbs/MMBtu	0.01	lbs/MMBtu	210	MMBtu/hr	1,839,600	MMBtu/yr	3.15	9.20	-	9.20
Total Modified/New Units											9.20		9.20
Total Increase													9.20
Total Decrease													0
Total Increase and Decrease													9.20

**Notes:**

1. NO<sub>x</sub> annual emission factor is based on engineering judgment for SCR Control, 30 day rolling average. NO<sub>x</sub> hourly emission factor is assumed to be 50% higher than the annual average factor to accommodate any operation fluctuation.

**Table B-3**  
**Potential SO<sub>2</sub> Emission Calculations for Combustion Units**  
**Frontier El Dorado Refinery**

Units	Equipment No.	SO <sub>2</sub> Hourly Emission Factor	SO <sub>2</sub> Annual Emission Factor	Potential Hourly Operations	Potential Annual Operations	Potential Hourly Emissions (lb/hr)	Potential Annual Emissions (TPY)	Baseline Emissions (TPY)	Project Increase (TPY)				
Modified/New Units													
HGU13 (New)	HGU3 Reformet Furnace (new)	0.026	lbs/MMBtu	0.0098	lbs/MMBtu	210	MMBtu/hr	1,839,600	MMBtu/yr	5.34	8.98	-	8.98
Total Modified/New Units												-	8.98
Total Increase													8.98
Total Decrease													0-
Total Increase and Decrease													8.98

**Notes:**

SO<sub>2</sub> Emission Factors are based on NSPS Ja limits

**3 Hour H<sub>2</sub>S Rolling Limit**

$$162 \text{ scf H}_2\text{S} / 10^6 \text{ scf} / 1020 \text{ Btu/scf} * 1E6 [\text{Btu/MMBtu}] * [1 \text{ lbmol} / 385.4 \text{ scf} * 64 \text{ lb SO}_2/\text{lbmol}] = 0.026 \text{ lb SO}_2/\text{MMBtu}$$

**Annual H<sub>2</sub>S Rolling Limit**

$$60 \text{ scf H}_2\text{S} / 10^6 \text{ scf} / 1020 \text{ Btu/scf} * 1E6 [\text{Btu/MMBtu}] * [1 \text{ lbmol} / 385.4 \text{ scf} * 64 \text{ lb SO}_2/\text{lbmol}] = 0.0098 \text{ lb SO}_2/\text{MMBtu}$$

Assume 0.5% of SO<sub>2</sub> is H<sub>2</sub>S, estimated H<sub>2</sub>S emissions are:

$$5.34 \text{ lb/hr SO}_2 * 0.005 = 0.028 \text{ lb/hr H}_2\text{S}$$

$$8.98 \text{ TPY SO}_2 * 0.005 = 0.045 \text{ TPY H}_2\text{S}$$

**Table B-15**  
**Potential NH<sub>3</sub> Emission Calculations for Combustion Units**  
**Frontier El Dorado Refinery**

Unit	Equipment No.	NH <sub>3</sub> Stack Concentration	Units	Potential Hourly Stack Flow	Potential Annual Stack Flow	Units	Potential Hourly Emissions (lb/hr)	Potential Annual Emissions (tPY)	Baseline Emissions (tPY)	Project Increase (tPY)	
Modified/New Units											
HGU3 (New)	HGU3 Reformer Furnace (new)	10	ppmv	2.51	MMscf/hr	21,990	MMscf/yr	1.11	4.82	-	4.82
Total Modified/New Units										4.82	
Total Increase										4.82	
Total Decrease										0	
Total Increase and Decrease										4.82	

Notes:

1. NH<sub>3</sub> Stack Concentration of 10 ppmv was estimated.

**Table B-16**  
**SCR: Potential NH<sub>3</sub> Fugitive Emission Calculations**  
**Frontier El Dorado Refinery**

Units	Service	Count	Factor (lb/hr-Source)	Emissions (lb/hr)	Emissions (TPY)
Valves	GV	0	0.00029	0.00	0.00
	LL	0	0.00036	0.00	0.00
Flanges	HL	0	0.0005	0.00	0.00
	All	48	0.00018	0.01	0.04
Pumps	LL	4	0.0041	0.02	0.07
	HL	0	0.0046	0.00	0.00
Compressors	All	0	0.1971	0.00	0.00
Relief Valves	GV	0	0.0986	0.00	0.00
Sample Connections	All	0	0.033	0.00	0.00
Drains <sup>2</sup>	All	0	0.00013	0.00	0.00
Average NH <sub>3</sub> Content <sup>3</sup> 30%					
Total				0.03	0.11
Total NH <sub>3</sub>				0.01	0.03
GHG <sup>1</sup> - CH <sub>4</sub>				0.00	0.00
Total HAP <sup>5</sup>				0.00	0.00

<sup>1</sup> SOCCMI Fugitive Emission Factors for components other than process drains are from Table 2-5 of EPA's Protocol for Equipment Leaks Emission Estimates

<sup>2</sup> Drain factor from Table 2-8, EPA's protocol for Equipment Leaks Emission Estimates, for "Other" Equipment Type for Water/Oil Service, < 10,000 ppmv

<sup>3</sup> Conservatively assume 30% NH<sub>3</sub> by weight in solution.

<sup>4</sup> No CH<sub>4</sub> in NH<sub>3</sub> Solution.

<sup>5</sup> No HAPs in NH<sub>3</sub> Solution.





Kansas Department of Health and Environment  
Division of Environment  
Bureau of Air and Radiation

INDIRECT HEATING UNIT (BOILER)

- 1) Source ID Number: 0150004
- 2) Company/Source Name: Frontier El Dorado Refining LLC
- 3) Emission Unit Identification: HGU3 - Reformer Furnace
- 4) Manufacturer: TBD Model No.: TBD
- 5) Maximum design heat-input rate:  $210 \times 10^6$  BTU/hr  
Heat-release Rate: TBD BTU/hr/cu. ft. of furnace volume  
Annual load factor: 100 %  
Heater design: Cyclone       ; Underfeed stoker       ; Spreader stoker       ;  
Pulverized (dry-tangential or normal/wet)       ; Other (specify) Direct Fired Catalytic Reformer;  
Normal Operating Schedule: 8760 hours/year  
Date of latest modification: 6/1/2013
- 6) Primary Fuel Type:  
Natural Gas        Oil        Coal        Other (specify) Refinery Fuel Gas  
Secondary Fuel Type:  
Natural Gas        Oil        Coal        Other (specify) PSA Off-Gas
- 7) If other fuel is waste liquid:  
What is the source of the waste? N/A  
Will the waste be pretreated to remove any of the contaminants? Yes       ; No        If yes, describe  
method of pretreatment:  
        
        
If waste liquid is used in combination with fuel oil:  
Specify the volume percent of waste liquid:        %  
Specify the anticipated annual operating hours during which the fuel and waste combination will be used:  
       hrs.  
Fill in the data below for the fuel oil.  
Include the chemical and physical characteristics of the waste liquid. Also, include any source emissions test data  
that is available from testing similar facilities that have disposed of this type liquid waste.

**INDIRECT HEATING UNIT (BOILER)**  
**(cont.)**

- 8) Fuel Specific Data: (if other is specified, give appropriate data)

Natural Gas:

Heating value: 1174 BTU/cu. ft. (avg.) (HHV - Fuel gas); 263.4 BTU/cu.ft. (HHV - PSA Off-Gas)

(If fuel gas is used, also specify %Sulfur: H<sub>2</sub>S < 162 ppmv 3-hour rolling average, < 60 ppmv 365-day rolling average)

Coal:

Fuel Parameters: %Sulfur: \_\_\_\_\_ % Ash: \_\_\_\_\_

Heating value: \_\_\_\_\_ BTU/lb.

Fuel Oil:

Fuel Parameters: %Sulfur: \_\_\_\_\_ Grade: \_\_\_\_\_

Heating value: \_\_\_\_\_ BTU/gal.

Density: \_\_\_\_\_ lb./gal.

- 9) Air Emissions Control Technology: NO<sub>x</sub> X SO<sub>x</sub> \_\_\_\_\_ CO \_\_\_\_\_ Particulate \_\_\_\_\_

If yes, breakdown of Control Technology: SCR

- 10) Soot blowing (if applicable): frequency: \_\_\_\_\_ duration: \_\_\_\_\_

- 11) Has boiler been derated because of: No

Fuel change \_\_\_\_\_ Equip. limitations \_\_\_\_\_ Regulatory compliance \_\_\_\_\_

- 12) Emissions discharge to atmosphere TBD ft. above grade through stack or duct TBD ft. diameter  
at TBD °F temperature, with TBD cfm flow rate and TBD fps velocity.

- 13) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting

- 14) Did construction, modification, or reconstruction commence after August 17, 1971 and on or before September 18, 1978 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 250 million BTU/hour? Yes \_\_\_\_\_; No X

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart D.

- 15) Did construction, modification, or reconstruction commence after September 18, 1978 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 250 million BTU/hour? Yes \_\_\_\_\_; No X

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Da.

- 16) Did construction, modification, or reconstruction commence after June 19, 1984 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 100 million BTU/hour but less than 250 million BTU/hour? Yes X; No \_\_\_\_\_

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Db.

**INDIRECT HEATING UNIT (BOILER)**  
**(cont.)**

- 17) Did construction, modification, or reconstruction commence after June 9, 1989 and does the indirect heating unit have a maximum design heat-input capacity to combust 10 million or more BTU/hour but less than 100 million BTU/hour? Yes \_\_\_\_; No X

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Dc.

**ATTACHMENT 2**  
**Updated CO<sub>2</sub>e Emissions for HGU3 Furnace**

**Table B-6**  
**Potential HAP and CO<sub>2</sub>e Emission Calculations for Combustion Units**  
**Frontier El Dorado Refinery**

Unit		HGU-3	Emission Totals
Source Name		HGU3 Reformer Furnace (new)	
Potential Firing Rate (MMBtu/hr)		210	
Pollutant	Emission Factor <sup>(1)</sup>	Emissions (lbs/yr)	(TPY)
<b>Organic HAP</b>			
2-Methylnaphthalene	2.4E-05	0.04	0.00
3-Methylchloranthrene	1.8E-06	0.00	0.00
7,12-Dimethylbenz(a)anthracene	1.6E-05	0.03	0.00
Acenaphthene	1.8E-06	0.00	0.00
Acenaphthylene	1.8E-06	0.00	0.00
Anthracene	2.4E-06	0.00	0.00
Benz(a)anthracene	1.8E-06	0.00	0.00
Benzene	2.1E-03	3.79	0.00
Benzo(a)pyrene	1.2E-06	0.00	0.00
Benzo(b)fluoranthene	1.8E-06	0.00	0.00
Benzo(g,h,i)perylene	1.2E-06	0.00	0.00
Benzo(k)fluoranthene	1.8E-06	0.00	0.00
Chrysene	1.8E-06	0.00	0.00
Dibenzo(a,h)anthracene	1.2E-06	0.00	0.00
Dichlorobenzene	1.2E-03	2.16	0.00
Fluoranthene	3.0E-06	0.01	0.00
Fluorene	2.8E-06	0.01	0.00
Formaldehyde	7.5E-02	135.26	0.07
Hexane	1.8E+00	3246.35	1.62
Indeno(1,2,3-cd)pyrene	1.8E-06	0.00	0.00
Naphthalene	6.1E-04	1.10	0.00
Phenanthrene	1.7E-05	0.03	0.00
Pyrene	5.0E-06	0.01	0.00
Toluene	3.4E-03	6.13	0.00
<b>Metal HAP</b>			
Arsenic	2.0E-04	0.36	0.00
Barium	4.4E-03	7.94	0.00
Beryllium	1.2E-05	0.02	0.00
Cadmium	1.1E-03	1.98	0.00
Chromium	1.4E-03	2.52	0.00
Cobalt	8.4E-05	0.15	0.00
Copper	8.5E-04	1.53	0.00
Manganese	3.8E-04	0.69	0.00
Mercury	2.6E-04	0.47	0.00
Molybdenum	1.1E-03	1.98	0.00
Nickel	2.1E-03	3.79	0.00
Selenium	2.4E-05	0.04	0.00
Vanadium	2.3E-03	4.15	0.00
Zinc	2.9E-02	52.30	0.03
<b>Total HAP<sup>(3)</sup></b>	-	<b>3,472.89</b>	<b>1.74</b>

Fuel Flow (scf/yr)		1,803,529,411.76	
Annual Average Carbon Content (kg C/kg fuel)		0.89	
Annual Average Molecular Weight (kg/kg-mol)		24.67	
Molar Volume Conversion Factor (@ 68° F)		849.50	
HHV (MMBtu/scf)		0.0010	
GHG - CO <sub>2</sub>	-	376,060,044	188,030
GHG - N <sub>2</sub> O (kg/MMBtu)	1.0E-03	4,056.32	2.03
GHG - CH <sub>4</sub> (kg/MMBtu)	1.0E-04	405.63	0.20
<b>Total CO<sub>2</sub>e<sup>(4), (5)</sup> in TPY</b>			<b>188,663.01</b>
HGU3 Design Rate (H <sub>2</sub> Production) in MMscf/day		20	
<b>GHG Emission Limit (lb CO<sub>2</sub>e / scf H<sub>2</sub> Production)</b>			<b>0.052</b>

**Notes**

<sup>(1)</sup> Emission Factors in units of (lb/lb scf); from AP-42 Table 1.4-3 for Organic HAPs, and Table 1.4-4 for Metal HAPs, dated 7/98.

<sup>(2)</sup> GHG emissions are calculated based on Eq. C-5 for CO<sub>2</sub> and Eq. C-8 for CH<sub>4</sub> and N<sub>2</sub>O in 40 CFR §98.33

<sup>(3)</sup> Total Hazardous Air Pollutants (HAPs)

<sup>(4)</sup> Fuel carbon content, molecular weight and heat content with contingency were used to calculate GHG emissions.

<sup>(5)</sup> Total Greenhouse Gas Emissions (GHG) in CO<sub>2</sub>e.

**Table 1-1 Project Emissions Increases Compared  
to PSD Significance Levels**

Source/ Source Category	Potential Emissions (tpy)												
	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	PM	PM <sub>10</sub>	PM <sub>2.5</sub>	H <sub>2</sub> SO Mist	H <sub>2</sub> S	NH <sub>3</sub>	HAPs	CO <sub>2</sub> e	
New HGU-3 Furnace	9.20	8.98	36.79	4.96	6.85	6.85	6.85	-	0.045	4.82	1.74	188,663.01	
HGU-3 Fugitives	-	--		0.12	--		-	-	--		0.05	0.64	
SCR Fugitives	-	-	--		-	---			-	0.03	-	-	
Crude Unit Fugitives (increase only)	-	--		7.61	--		-	-	--		3.04	39.94	
Naphtha Fract. Tower Fugitives (net increase only)	-	--		1.31	--		-	-	--		0.52	6.89	
ISOM Fugitives (increase only)	-	--		1.40	--		-	-	--		0.56	7.35	
Gas Con Fugitives (increase only)	-	--		1.30	--		-	-	--		0.52	6.82	
Cooling Tower (new)	-	--	-	0.47	0.12	0.12	0.12	-	-	-	-	2.48	
Gasoline Tanks	-	--		0.10	--		-	-	--		0.04	-	
Isomerase Tanks	-	--		2.55	--		-	-	--		1.66	-	
HGU-3 Atmospheric Vent	-	--		0.39	--		-	-	-	0.20	-	-	
HGU-3 Analyzer Vents	-	-	0.19	0.0004	-	---			-	--		2.08	
Total Project Increases	9.20	8.98	36.98	20.22	6.97		6.97	6.97	0.00	0.045	5.05	8.13	188,729.21
PSD Significance Level	40	40	100	40	25	15	10	7	10	N/A	N/A	75,000	
PSD/Netting Required (Y/N)	No	No	No	No	No	No	No	No	No	N/A	N/A	Yes	

**ATTACHMENT 3**  
**Revised Annualized Cost for CCS**  
**and**  
**Revised HGU3 Average VOC Content Calculations**

**Table S-3**  
**Estimated Cost for CCS of Stack CO<sub>2</sub> Emissions**  
**Frontier El Dorado Refinery**

**CO<sub>2</sub> Pipeline Data**

Pipeline Length	90 miles	to Andarko CO <sub>2</sub> Pipeline
Pipeline Diameter	6 inches	
Number of Injection Wells		
Short Ton of CO <sub>2</sub>	188,663.01 tons/yr	
Captured Short Ton of CO <sub>2</sub>	175,457 tons/yr	

**CCS Cost Breakdown**

Cost Type	Units	Pipeline Costs	Other Costs
Pipeline Materials	\$ Diameter (inches) Length (miles)	\$64,632 + \$1.85 x L x (330.5 x D <sup>2</sup> + 686.7 x D + 26,920)	\$ 7,213,842.30
Pipeline Labor	\$ Diameter (inches) Length (miles)	\$341,627 + \$1.85 x L x (343.2 x D <sup>2</sup> + 2,074 x D + 170,013)	\$ 32,777,858.30
Pipeline Miscellaneous	\$ Diameter (inches) Length (miles)	\$150,166 + \$1.58 x L x (8.417 x D + 7.234)	\$ 8,360,225.20
Pipeline Right of Way	\$ Diameter (inches) Length (miles)	\$48,037 + \$1.20 x L x (577 x D + 29,788)	\$ 3,639,037.00
Compression	\$	14,000,000	\$ 14,000,000.00
Amine Unit	\$	200,000,000	\$ 200,000,000.00
CO <sub>2</sub> Surge Tank	\$	1,150,636	\$ 1,150,636.00
Pipeline Control System	\$	110,632	\$ 110,632.00
Fixed O&M	\$/mile/yr	8,632	\$ 8,632
		Total Pipeline Cost =	\$ 267,260,862.80

**Amortized Cost**

Total Capital Investment (TCI) =	\$ 267,260,862.80
Capital Recovery Factor (CRF) = $i(1+i)^n / ((1+i)^n - 1)$	0.15
i = interest rate =	0.08
n = equipment life =	10 years
Amortized Installation Costs = CRF*TCI = \$ 39,829,749.73	
Total Pipeline Annualized Cost \$ 39,829,749.73	
Cost per short ton CO <sub>2</sub> \$ 227.01	



Table B-8

**HGU-3: Potential Fugitive Emission Calculations**  
**Frontier El Dorado Refinery**

Units	Service	Count	Factor <sup>1</sup> (lb/hr-Source)	Emissions (lb/hr)	Emissions (TPY)
Valves	GV	98	0.00029	0.03	0.12
	LL	0	0.00036	0.00	0.00
	HL	0	0.0005	0.00	0.00
Flanges	All	226	0.00018	0.04	0.18
Pumps	LL	0	0.0041	0.00	0.00
	HL	0	0.0046	0.00	0.00
Compressors	All	0	0.1971	0.00	0.00
Relief Valves <sup>2</sup>	GV	0	0.0986	-	-
Sample Connections	All	10	0.033	0.33	1.45
Drains <sup>3</sup>	All	0	0.00013	0.00	0.00
Average VOC Content	7.1%				
			Total	0.03	0.12
			GHG <sup>4</sup> - CH <sub>4</sub>	0.007	0.03
			Total HAP <sup>5</sup>	0.011	0.05

<sup>1</sup> SOCOMI Fugitive Emission Factors for components other than process drains are from Table 2-5 of EPA's protocol for Equipment Leaks Emission Estimates

<sup>2</sup> All relief valves in VOC service are routed to the flares.

<sup>3</sup> Drain factor from Table 2-8, EPA's protocol for Equipment Leaks Emission Estimates, for "Other" Equipment Type for Water/Oil Service, < 10,000 ppmv

<sup>4</sup> Conservatively assume 25% VOC is CH<sub>4</sub>

<sup>5</sup> Conservatively assume 40% VOC is HAP

**Table B-8a**  
**HGU-3 Average VOC Content Calculations**

Component Type	Valves	Valves	Valves	Pump Seals	Pump Seals	Comp. Seals	Rd. Valves	Flanges	Open-End	Sampling	Process	VOC Content
Service Type	Gas	Lt. Liq.	Hvy. Liq.	Lt. Liq.	Hvy. Liq.	Gas/Vap.	Gas/Vap.	All	Lines, All	Con. All	Drains	wt%
Process Factors (lb/hr/component)	0.00029	0.00036	0.00051	0.0041	0.0046	0.1971	0.0986	0.00018	0.00033	0.033	0.00013	-
<b>Total Component Count</b>	98	0	0	0	0	0	0	226	0	10	0	-
Plant Fuel Gas Component Count	77	0	0	0	0	0	0	166	0	5	0	13
Ammonia Component Count	21	0	0	0	0	0	0	60	0	5	0	0

Component Type	Valves	Valves	Valves	Pump Seals	Pump Seals	Comp. Seals	Rd. Valves	Flanges	Open-End	Sampling	Process	Emissions (lb/hr)	VOC Emissions (lb/hr)
Service Type	Gas	Lt. Liq.	Hvy. Liq.	Lt. Liq.	Hvy. Liq.	Gas/Vap.	Gas/Vap.	All	Lines, All	Con. All	Drains	(lb/hr)	(lb/hr)
Plant Fuel Gas	0.022	0	0	0	0	0	0.0000	0.0296	0	0.165	0	0.22	0.03
Ammonia	0.006	0	0	0	0	0	0.0000	0.0107	0	0.165	0	0.18	0.00
<b>Total</b>												0.40	0.03
Average VOC Content (Total VOC Emissions/Total Emissions)												--	7.1%

**ATTACHMENT 4**  
**Proposed Emission Limit, Monitoring, Recordkeeping**  
**and Reporting for GHG**

**Proposed Special Conditions for Greenhouse Gas Emissions  
Naphtha Fractionation Project  
Frontier El Dorado Refining LLC**

**BEST AVAILABLE CONTROL TECHNOLOGY**

The selection of control technology for GHG emissions or CO<sub>2</sub>e (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O), was based on the BACT analysis using a “top-down” approach, as listed below:

1. BACT Determination for the HGU-3 Reformer Furnace

BACT is determined to be the use of energy efficient work practices recognized by the EPA to maintain a CO<sub>2</sub>e emission limit of 188,663 tons on any consecutive 12-month rolling period and 0.052 lb CO<sub>2</sub>e/scf H<sub>2</sub> production on 12-month rolling average.

2. BACT Determination for Naphtha Fractionation Project Fugitives

BACT is determined to be the implementation of the EPA’s Refinery MACT Leak Detection and Repair (LDAR) program that monitors for Total Hydrocarbon (THC) instead of total VOC for methane emissions from fugitive components containing methane concentration equal to or greater than 10% by volume in process units associated with the Naphtha Fractionation Project.

**MONITORING**

1. The HGU-3 Reformer Furnace shall have fuel metering for each individual fuel, either combusted alone or in combination with other allowable fuels, and the owner or operator shall:
  - a. Continuously measure and record the fuel flow rate to the Reformer Furnace using standard flow meters.
  - b. Conduct fuel sampling and analysis in accordance with the procedures from the EPA GHG MRR (40 CFR Part 98, Subpart C). The analysis shall at a minimum allow for the determination of the fuels’ volumetric heat content, carbon content, and molecular composition. The profile shall be used to determine the fuel molecular weight.
2. The owner or operator shall implement the EPA’s Refinery MACT LDAR program to monitor fugitive emissions of methane emissions from process units associated with the Naphtha Fractionation Project.

## **RECORDKEEPING**

1. The owner or operator shall maintain the following records to demonstrate compliance with the GHG emission limit of 188,663 tons/ on any consecutive 12-month rolling period and 0.052 lb CO<sub>2</sub>e/scf H<sub>2</sub> production on 12-month rolling basis:
  - a. Records of monthly fuel usage for each fuel type consumed by the HGU-3 Reformer Furnace.
  - b. Records of fuel sampling of fuels consumed by the HGU-3 Reformer Furnace as required by 40 CFR Part 98, Subpart C.
  - c. CO<sub>2</sub>e emissions shall be calculated using the fuel usage and fuel sampling data in accordance with acceptable method(s) from the EPA GHG MRR (40 CFR Part 98, Subpart C).
  - d. Records of the calculated CO<sub>2</sub>e emissions, H<sub>2</sub> production, and the results of the calculated ratio of lb CO<sub>2</sub>e /scf H<sub>2</sub> production on a 12-month rolling period basis.
  - e. Records of the 12-month rolling period shall be updated monthly no later than the last day of the following calendar month.
2. All records used to demonstrate compliance with the GHG emission limit shall be maintained for at least 5 years following the date of such measurements, and calculations.

## **REPORTING**

1. If, at the end of any calendar quarter, the facility's actual operations exceed 85% of the operational limitations (i.e. if GHG emissions are more than 160,364 tons per 12 month period) for the past four calendar quarters, the owner or operator shall report the actual operations to the department for that period of time. This report shall be submitted to KDHE within 45 days of the last day of the month following the conclusion of the calendar quarter.

**ATTACHMENT 5**  
**Markups of Approval for CokerHGU3 Project**



## AIR EMISSION SOURCE CONSTRUCTION APPROVAL

**Source ID No.:** 0150004

**Effective Date:** May 19, 2011 (Revised April 13, 2012 and XX/XX/XXXX)

**Source Name:** Frontier El Dorado Refining Company

**SIC Code:** 2911; Petroleum Refining

**NAICS Code:** 324110; Petroleum Refineries

**Source Location:** 1401 South Douglas Road.  
El Dorado, Butler County, KS 67042

**Mailing Address:** P.O. Box 1121  
El Dorado, KS 67042

**Contact Person:** Andrew Beard  
Environmental Specialist  
Telephone No. (316) 321-8478

Deleted: Jimmy Nguyen

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This approval is issued pursuant to K.S.A. 65-3008 as amended.

### Description of Activity Subject to Air Pollution Control Regulations

Frontier El Dorado Refining Company (FEDRC) is proposing to construct a new Hydrogen Generation Unit No. 3 and replace two existing heaters in order to process more sour crude and provide additional high purity hydrogen for the refinery. The new reformer furnace and heaters will be equipped with ultra low NO<sub>x</sub> burners. As a result of this project, certain requirements in the February 14, 1991 Air Emission Approval are no longer applicable and will be eliminated as part of this document.

Emissions of oxides of nitrogen (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), particulate matter (PM), PM with an aerodynamic diameter less than or equal to 10 micrometers (PM<sub>10</sub>), volatile organic compounds (VOC), and hazardous air pollutants (HAPs) were evaluated as part of the review process. This project does not constitute a major modification under 40 CFR 52.21, *Prevention of Significant Deterioration (PSD) of air quality* as adopted by K.A.R. 28-19-350. The project emissions increase is above the PSD significant thresholds for NO<sub>x</sub> and CO; however, the project net emissions are below the PSD significant thresholds for these pollutants:

This project requires a construction approval under the provisions of K.A.R. 28-19-300 (Construction permits and approvals; applicability) because the project net emissions exceed the levels specified in K.A.R. 28-19-300(b). In addition, equipment associated with the project is subject to federal requirements adopted by K.A.R. 28-19-720 (New source performance standards), K.A.R. 28-19-735 (National emission standards for hazardous air pollutants), and K.A.R. 28-19-750 (Hazardous air pollutants; maximum achievable control technology).

The approval for this project was originally issued on May 19, 2011 and was revised on April 13, 2012 to update the project net emissions to include additional projects, specifically the HTU-1 Heaters and Crude Heaters projects, anticipated to be completed prior to completion of this project. As a result, the contemporaneous period for this project includes emissions from these additional projects.

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The approval for this project is being revised to delete emissions associated with the new Hydrogen Generation Unit No. 3 since this unit has not been constructed. A new Hydrogen Unit No. 3 is proposed under a separate project.

### Significant Applicable Air Pollution Control Regulations

The project, as proposed, is subject to Kansas Administrative Regulations, relating to air pollution control. The following state regulations were determined to be applicable to this source:

1. K.A.R. 28-19-31 Indirect Heating Equipment Emissions – Emission Limitations
2. K.A.R. 28-19-650(a)(3) Emissions Opacity Limits
3. K.A.R. 28-19-720 New Source Performance Standards, which adopts by reference *40 CFR Part 60 Subpart A, General Provisions*
4. K.A.R. 28-19-720 New Source Performance Standards, which adopts by reference *40 CFR Part 60 Subpart Ja, Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007*
5. K.A.R. 28-19-720 New Source Performance Standards, which adopts by reference *40 CFR Part 60 Subpart GGa, Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006*
6. K.A.R. 28-19-735 National Emission Standards for Hazardous Air Pollutants which adopts by reference *40 CFR Part 61 Subpart A, General Provisions, and 40 CFR Part 61 Subpart FF, National Emission Standard for Benzene Waste Operations*
7. K.A.R. 28-19-750 Hazardous Air Pollutants; Maximum Achievable Control Technology, which adopts by reference *40 CFR Part 63 Subpart A, General Provisions, and 40 CFR Part 63 Subpart CC, National Emission Standards for Hazardous Air Pollutants From Petroleum Refineries*

### Air Emission Unit Technical Specifications

The following equipment or equivalent is approved:

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New Hydrogen Generation Unit No. 3 (HGU-3) [includes reformer furnace, pressure swing adsorption purification unit, and fugitive equipment] – The reformer furnace will be equipped with ultra low NO<sub>x</sub> burners and will have a potential annual average heater duty of 388 MMBTU/hr.

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1. Replacement of Coker heaters, B-2601 and B-2607, with a new heater package consisting of two heaters in parallel – The heaters, B-2609 and B-2610, will be equipped with ultra low NO<sub>x</sub> burners and will have a total potential annual average heater duty of 177 MMBTU/hr.
3. Modification to Hydrotreating Unit No. 4 (HTU-4) [includes installing feed filters and a second heat exchanger and adding fugitive equipment]

#### Air Emissions Estimates from the Proposed Activity

Pollutant	Project Increases	Contemporaneous Emission Changes	Project Net Emissions
	Tons Per Year		
NO <sub>x</sub>	31.01	-	31.01
SO <sub>2</sub>	6.70	-	6.70
CO	46.52	-	46.52
PM	9.33	-	9.33
PM <sub>10</sub>	9.33	-	9.33
VOC	4.20	-	4.20
H <sub>2</sub> S	0.03	-	0.03
HAPs	1.45	-	1.45

#### Air Emission Limitations

1. K.A.R. 28-19-31(a): Aggregated emissions of particulate matter from indirect heating equipment shall not exceed those specified in Table H-1 or for equipment having intermediate heat input between 10(10<sup>6</sup>) BTU/hr and 10,000(10<sup>6</sup>) BTU/hr, the allowable emission rate may be determined by the equation provided in K.A.R. 28-19-31(a).
2. K.A.R. 28-19-31(b)(2): Opacity of visible emissions from the B-2609 and B-2610 is limited to less than 20 percent.
3. 40 CFR Part 60 Subpart Ja: Any fuel gas burned in the B-2609 and B-2610 shall not contain hydrogen sulfide (H<sub>2</sub>S) in excess of 162 ppmv determined on a 3-hour rolling average basis and H<sub>2</sub>S in excess of 60 ppmv determined daily on a 365 successive calendar day rolling average basis. [40 CFR 60.102a(g)(1)(ii)]
4. 40 CFR Part 60 Subpart Ja: Emissions of NO<sub>x</sub> from the B-2609 and B-2610 are limited on a 30-day rolling average basis to 40 ppmv (dry basis, corrected to 0 percent excess air); or 0.040 lb/MMBtu higher heating value basis. [40 CFR 60.102a(g)(2)]

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4. K.A.R. 28-19-31(d): Emissions of NO <sub>x</sub> from the HGU-3 reformer furnace are limited to 0.30 pounds per MMBTU or less.
5. K.A.R. 28-19-650(a)(3): Opacity of visible emissions from equipment/operations associated with HGU-3, other than the reformer furnace, is limited to 20 percent or less.
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### Description of Previous Permit(s) or Approval(s) Subject to Amendment

The Air Emission Approval dated February 14, 1991 included a limitation on the NO<sub>x</sub> emission rate from Coker Unit No. B-2601. This unit is being replaced as a result of the proposed project; therefore, the current limitation is no longer applicable.

The following requirements, conditions, standards or limitations are to be amended by this approval:

1. Air Emission Approval dated February 14, 1991, Approval Condition #4:

Burners capable of achieving an emission rate of 0.12 lb of nitrogen oxides per million BTU of heat input are to be installed in the Coker Unit No. B-2601.

This condition is no longer applicable and is hereby revoked.

**All other Conditions/Limitations/Standards from the February 14, 1991 Air Emission Approval that have not been revoked remain in effect.**

A copy of the aforementioned approval is attached for FEDRC's reference.

### Approval Conditions

1. The owner or operator shall not burn in the B-2609 and B-2610 any fuel gas that contains H<sub>2</sub>S in excess of 60 ppmv determined daily on a 365 successive calendar day rolling average basis.
2. B-2609 and B-2610 shall be equipped with ultra low NO<sub>x</sub> burners and shall meet a NO<sub>x</sub> emission limit of 0.04 lb/MMBTU.
3. B-2609 and B-2610 shall meet a CO emission limit of 0.06 lb/MMBTU.
4. The owner or operator shall conduct performance testing on the B-2609 and B-2610 within 180 days of startup to verify the NO<sub>x</sub> and CO emission limits specified in paragraphs #2 and #3 above. The performance test shall be conducted in accordance with EPA test methods or any other KDHE approved test method. If the performance test result is greater than any of the specified emission limits (3-hour average), FEDRC shall submit a request to modify this approval, as appropriate, and a revised netting calculation within 60 calendar days after receipt of the performance test.
5. The existing Coker heaters, B-2601 and B-2607, shall be permanently removed from service upon startup of the new heaters.

### 40 CFR Part 60 Subpart Ja for B-2609 and B-2610

1. In accordance with the work practice standards in 40 CFR 60.103a(b), the owner or operator shall conduct a root cause analysis of any emission limit exceedance or process start-up, shutdown, upset, or malfunction that causes a discharge to the atmosphere in excess of 227 kilograms per day (500 lb per day) of SO<sub>2</sub>.
2. In accordance with the test methods and procedures in 40 CFR 60.104a, the owner or operator shall conduct a performance test, as applicable, to demonstrate initial compliance with the applicable emission limits in 40 CFR 60.102a according to the requirements of 40 CFR 60.8.

Deleted: 1. The owner or operator shall limit the heat input rate of the HGU-3 reformer furnace to no more than 120 MMBTU/hr on a twelve (12) month rolling average when burning refinery fuel gas and/or natural gas.

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3. The owner or operator shall monitor emissions and operations in accordance with 40 CFR 60.107a, as applicable.
4. The owner or operator shall maintain records and submit excess emissions reports in accordance with 40 CFR 60.108a, as applicable.

#### **Monitoring and Recordkeeping**

1. The owner or operator shall keep records of the 365 day rolling average concentration of H<sub>2</sub>S in the fuel gas.
2. In accordance with K.A.R. 28-19-350(b)(3)(B), the owner or operator shall document and maintain the applicable information specified in 40 CFR 52.21(r)(6).

#### **Notification**

1. The owner or operator shall submit to KDHE written notification of the applicable information specified in 40 CFR 60.7(a) for the affected facilities. Please use the enclosed NSPS Notification form to submit the required information.
2. Notify the Air Program Field Staff at the South Central District Office in Wichita at (316) 337-6042 when the proposed project is complete so that an evaluation can be conducted.

#### **General Provisions**

1. This document shall become void if the construction or modification has not commenced within 18 months of the effective date, or if the construction or modification is interrupted for a period of 18 months or longer.
2. A construction permit or approval must be issued by KDHE prior to commencing any construction or modification of equipment or processes which results in potential-to-emit increases equal to or greater than the thresholds specified at K.A.R. 28-19-300.
3. Upon presentation of credentials and other documents as may be required by law, representatives of the KDHE (including authorized contractors of the KDHE) shall be allowed to:
  - a. enter upon the premises where a regulated facility or activity is located or conducted or where records must be kept under conditions of this document;
  - b. have access to and copy, at reasonable times, any records that must be kept under conditions this document;
  - c. inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this document; and
  - d. sample or monitor, at reasonable times, for the purposes of assuring compliance with this document or as otherwise authorized by the Secretary of the KDHE, any substances or

**Deleted:** 40 CFR Part 60 Subpart GGGa for HGU-3¶

¶ The owner or operator shall comply with the following requirements as soon as practicable, but not later than 180 days after initial startup:¶

1. . . . The owner or operator shall comply with the requirements of 40 CFR 60.482-1a through 60.482-10a. [40 CFR 60.592a(a)]¶

2. . . . The owner or operator may elect to comply with the requirements of 40 CFR 60.592a(b) as an alternative to the requirements in 40 CFR 60.482-7a.¶

3. . . . The owner or operator shall comply with the test methods and procedures provisions of 40 CFR 60.483a.¶

4. . . . The owner or operator shall comply with the recordkeeping and reporting provisions of 40 CFR 60.486a and 60.487a.¶

5. . . . The owner or operator may comply with the exceptions to the provisions of 40 CFR Part 60 Subpart VVa as specified in 40 CFR 60.593a.¶

**40 CFR Part 61 Subpart FF and 40 CFR Part 63 Subpart CC for HGU-3¶**

¶ 1. . . . The owner or operator shall comply with any applicable requirements of 40 CFR Part 61 Subpart FF.¶

2. . . . In accordance with 40 CFR 63.640, the owner or operator shall comply with the applicable provisions of 40 CFR Part 63 Subpart CC upon initial startup.¶

3. . . . In accordance with 40 CFR 63.640(p)(2), equipment leaks subject to 40 CFR Part 63 Subpart CC that are also subject to the provisions of 40 CFR Part 60 Subpart GGGa are required to comply only with the provisions specified in 40 CFR Part 60 Subpart GGGa.¶

**Deleted:** The owner or operator shall monitor and record the heat input rate (MMBTU/hr) of the HGU-3 reformer furnace daily and monthly. Records of the 12-month rolling period shall be updated monthly no later than one month after the end of the 12-month period. ¶

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parameters at any location.

4. The emission unit or stationary source which is the subject of this document shall be operated in compliance with all applicable requirements of the Kansas Air Quality Act and the federal Clean Air Act.
5. This document is subject to periodic review and amendment as deemed necessary to fulfill the intent and purpose of the Kansas Air Quality Statutes and Regulations.
6. This document does not relieve the permittee of the obligation to obtain other approvals, permits, licenses, or documents of sanction which may be required by other federal, state, or local agencies.

**Permit Engineer**

\_\_\_\_\_  
Rasha S. Allen  
Environmental Scientist  
Air Permitting Section

\_\_\_\_\_  
Date Signed

RSA:  
c: David Butler, SCDO  
C-10097